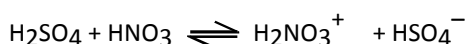


T08D02 – 8.1-8.4 IB Practice

Name.....

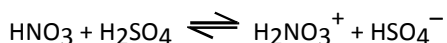
1. Which of the following is/are formed when a metal oxide reacts with a dilute acid?
- A metal salt
 - Water
 - Hydrogen gas
- A. I only
B. I and II only
C. II and III only
D. I, II and III
2. The pH of a solution is 2. If its pH is increased to 6, how many times greater is the $[H^+]$ of the original solution?
- A. 3
B. 4
C. 1000
D. 10 000
3. The equation for the reaction between nitric acid and sulfuric acid is shown below.



Which species are acting as acids in this reaction according to the Brønsted-Lowry theory?

- A. H_2SO_4 and HNO_3
B. H_2SO_4 and $H_2NO_3^+$
C. HNO_3 and $H_2NO_3^+$
D. $H_2NO_3^+$ and HSO_4^-
4. Four aqueous solutions, I, II, III and IV, are listed below.
- $0.100 \text{ mol dm}^{-3} \text{ HCl}$
 - $0.010 \text{ mol dm}^{-3} \text{ HCl}$
 - $0.100 \text{ mol dm}^{-3} \text{ NaOH}$
 - $0.010 \text{ mol dm}^{-3} \text{ NaOH}$
- What is the correct order of **increasing** pH of these solutions?
- A. I, II, III, IV
B. I, II, IV, III
C. II, I, III, IV
D. II, I, IV, III

5. Which is a conjugate acid-base pair in the following reaction?



- A. HNO_3 and H_2SO_4
B. HNO_3 and $H_2NO_3^+$
C. HNO_3 and HSO_4^-
D. $H_2NO_3^+$ and HSO_4^-
6. Which equation represents an acid-base reaction according to the Lewis theory **but** not the Brønsted-Lowry theory?
- A. $NH_3 + HCl \rightleftharpoons NH_4Cl$
B. $2H_2O \rightleftharpoons H_3O^+ + OH^-$
C. $NaOH + HCl \rightleftharpoons NaCl + H_2O$
D. $CrCl_3 + 6NH_3 \rightleftharpoons [Cr(NH_3)_6]^{3+} + 3Cl^-$
7. Which **one** of the following species can act as both a Brønsted-Lowry acid and base in aqueous solution?
- A. CH_3COOH
B. NO_3^-
C. $H_2PO_4^-$
D. OH^-

8. Define the terms *strong acid* and *weak acid*. Using hydrochloric and ethanoic acid as examples, write equations to show the dissociation of each acid in aqueous solution.

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(Total 4 marks)

9. (i) Calcium carbonate is added to separate solutions of hydrochloric acid and ethanoic acid of the same concentration. State **one** similarity and **one** difference in the observations you could make.

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(2)

- (ii) Write an equation for the reaction between hydrochloric acid and calcium carbonate.

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(2)

- (iii) Determine the volume of 1.50 mol dm^{-3} hydrochloric acid that would react with exactly 1.25 g of calcium carbonate.

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(3)

- (iv) Calculate the volume of carbon dioxide, measured at 273 K and $1.01 \times 10^5 \text{ Pa}$, which would be produced when 1.25 g of calcium carbonate reacts completely with the hydrochloric acid.

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(2)

(Total 9 marks)

10. The pH values of solutions of three organic acids of the same concentration were measured.

acid X	pH = 5
acid Y	pH = 2
acid Z	pH = 3

- (i) Identify which solution is the least acidic.

(1)

- (ii) Deduce how the $[\text{H}^+]$ values compare in solutions of acids Y and Z.

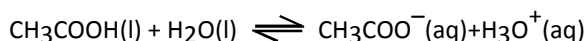
(2)

- (iii) Arrange the solutions of the three acids in decreasing order of electrical conductivity, starting with the greatest conductivity, giving a reason for your choice.

(2)

(Total 5 marks)

11. The equilibrium reached when ethanoic acid is added to water can be represented by the following equation:



Define the terms Brønsted-Lowry acid and Lewis base, and identify two examples of each of these species in the equation.

(Total 4 marks)

12. Put on another sheet if needed: Identify **one** example of a strong acid and **one** example of a weak acid. Outline **three** different methods to distinguish between equimolar solutions of these acids in the laboratory. State how the results would differ for each acid.

(Total 5 marks)